Amendments to the Abstract:

Please replace the originally filed abstract with the following amended abstract:

ABSTRACT OF THE DISCLOSURE

An optically-pumped mode-locked fiber ring laser for optical clock recovery of multiple wavelength division multiplexed optical signals actively mode-locks a plurality of outputs of the laser as a plurality of recovered clocks for a plurality of the multiple wavelength division multiplexed optical signals. The laser cavity has a cavity length corresponding to an integer multiple of bit periods of at least one of the multiplexed optical signals for receiving a pre-amplified version of the plurality of wavelength division multiplexed optical signals to provide gain modulation through a phase-insensitive parametric amplification and recirculating a proportion of the output from the laser cavity back through the laser cavity for spatially mode-locking the output of the laser cavity as a recovered clock whereby the recovered optical clock each having a periodic train of optical pulses with a repetition rate corresponding to the clock rate of the corresponding multiplexed optical signal is generated by mode-locking of the optically-pumped laser produced by a spatial modulation of the phase-insensitive parametric gain produced by the pulsed nature of the wavelength division multiplexed optical signals. A nonlinear gain medium disposed in the cavity has a sufficiently large dispersion at all of the wavelengths corresponding to the multiple wavelength multiplexed optical signals for minimizing four-wave mixing crosstalk among the multiple wavelength multiplexed optical signals, among the recovered clocks, and between the plurality of multiple wavelength multiplexed optical signals and the recovered clocks. The gain medium is pumped by the plurality of pre-amplified multiplexed optical signals to provide efficient gain modulation through the phase-insensitive parametric amplification at a plurality of narrow wavelength bands, each of the plurality of narrow wavelength bands immediately adjacent to a wavelength of a corresponding optical signal and each of the plurality of narrow wavelength bands including a corresponding recovered optical clock wavelength, and each of the corresponding optical signals copropagating in the laser cavity through

the nonlinear gain medium with the recovered optical clocks. A parametric optical amplifier <u>or a Raman amplifier</u> having an inhomogenously broadened gain amplifies the plurality of recovered clocks for compensating a portion of the cavity loss at all wavelengths of the plurality of recovered clocks. A wavelength selector passes the light at the plurality of wavelengths of the recovered clocks for recirculation in the laser cavity and preventing the light from the multiple wavelength division multiplexed optical signals and a plurality of idler waves generated by four wave mixing between the multiple wavelength division multiplexed optical signals and recovered optical clocks from recirculating in the laser cavity

Attorney Patent Docket No. SP03-129

PHASE-INSENSITIVE RECOVERY OF CLOCK PULSES OF WAVELENGTH DIVISION MULTIPLEXED OPTICAL SIGNALS

ABSTRACT OF THE DISCLOSURE

An optically-pumped mode-locked fiber ring laser for optical clock recovery of multiple wavelength division multiplexed optical signals actively mode-locks a plurality of outputs of the laser as a plurality of recovered clocks for a plurality of the multiple wavelength division multiplexed optical signals. The laser cavity has a cavity length corresponding to an integer multiple of bit periods of at least one of the multiplexed optical signals for receiving a pre-amplified version of the plurality of wavelength division multiplexed optical signals to provide gain modulation through a phase-insensitive parametric amplification and recirculating a proportion of the output from the laser cavity back through the laser cavity for spatially mode-locking the output of the laser cavity as a recovered clock whereby the recovered optical clock each having a periodic train of optical pulses with a repetition rate corresponding to the clock rate of the corresponding multiplexed optical signal is generated by mode-locking of the optically-pumped laser produced by a spatial modulation of the phase-insensitive parametric gain produced by the pulsed nature of the wavelength division multiplexed optical signals. A nonlinear gain medium disposed in the cavity has a sufficiently large dispersion at all of the wavelengths corresponding to the multiple wavelength multiplexed optical signals for minimizing four-wave mixing crosstalk among the multiple wavelength multiplexed optical signals, among the recovered clocks, and between the plurality of multiple wavelength multiplexed optical signals and the recovered clocks. The gain medium is pumped by the plurality of pre-amplified multiplexed optical signals to provide efficient gain modulation through the phase-insensitive parametric amplification at a plurality of narrow wavelength bands, each of the plurality of narrow wavelength bands immediately adjacent to a wavelength of a corresponding optical signal and each of the plurality of narrow wavelength bands including a corresponding recovered optical clock wavelength, and each of the corresponding optical

signals copropagating in the laser cavity through the nonlinear gain medium with the recovered optical clocks. A parametric optical amplifier or a Raman amplifier having an inhomogenously broadened gain amplifies the plurality of recovered clocks for compensating a portion of the cavity loss at all wavelengths of the plurality of recovered clocks. A wavelength selector passes the light at the plurality of wavelengths of the recovered clocks for recirculation in the laser cavity and preventing the light from the multiple wavelength division multiplexed optical signals and a plurality of idler waves generated by four wave mixing between the multiple wavelength division multiplexed optical signals and recovered optical clocks from recirculating in the laser cavity.